Amendment 1

TO

RTCM STANDARD 11010.2

FOR

406 MHZ SATELLITE PERSONAL LOCATOR BEACONS (PLBs)

DEVELOPED BY
RTCM SPECIAL COMMITTEE NO. 110

AUGUST 23, 2010

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PERSONAL LOCATOR BEACONS (PLBs)

RTCM Standard 11010.2 - 406 MHz Satellite Personal Locator Beacons (PLBs), dated July 10, 2008 (RTCM Paper 114-2008-SC110-STD), is revised as follows:

1. Replace Appendix G at page 81 with Appendix G contained herein.

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Annex G
(normative)
Internal Navigation Device Test Methods and Test Procedures

G.1 INTRODUCTION

This test procedure only applies to PLBs fitted with Internal Navigation Devices (GNSS Receivers) and encoded with either National Location or Standard Location Protocols. PLBs encoded with the User Location Protocol shall not be permitted. At this time the following tests are only applicable to PLBs fitted with GPS Receivers. For any PLBs fitted with any other type of GNSS Receiver (e.g. GALILEO or GLONASS), the manufacturer shall consult with the relevant national administration type approval authority for guidance. The following test procedure is considered satisfactory for performing the subject tests; however, it is recognized that alternate procedures may be performed. Such alternate procedures may be used if the test provider can show that they provide equivalent information.

The tests specified herein are designed to simulate a range of typical operational scenarios in which PLBs could be activated and required to obtain a GNSS fix for inclusion in a transmitted location protocol message. The tests measure how quickly the PLB is able to obtain a GPS location (Time To First Fix (TTFF)) and how accurate that transmitted position is (Location Accuracy).

The scenarios may be performed in any sequence and in conjunction with other electrical tests, in the context of Annex A.2 these tests shall be treated as Additional Tests and may be performed on a separate PLB if required. In all cases, the tests shall be conducted after the PLB has been temperature stabilized at ambient temperature for at least 1 hour. The tests shall be performed on a fully packaged PLB, similar to the proposed production beacons, operating on its normal power source and equipped with its proper antenna as defined in A.1.7. The tests shall be performed with both the 406 MHz and 121.5 MHz transmitters radiating normally. The PLB shall be specially programmed to transmit data bursts encoded using a test location protocol of appropriate type and format (see C/S T.007 and Appendix G for details).

A test chamber with the appropriate level of RF shielding (see G.3) shall be used, such that the PLB may radiate normally on 121.5 MHz. Care shall be taken with the beacon coding and test chamber shielding so as not to transmit distress signals on distress and safety frequencies. Frequency offsetting of the 121.5MHz homer shall not be permitted.

Two sets of tests are specified in this Annex, one set for "Land" scenarios and a second set for "Maritime" scenarios, both sets of scenarios shall be applied to all PLBs regardless of their classification or class.

G.2 TEST DESCRIPTION

G.2.1 General

The tests specified herein are designed to simulate typical operational scenarios in which PLBs could be activated and required to obtain a GNSS fix for inclusion in a transmitted location protocol message. Due to variations in GNSS satellite coverage in different locations and at different times of the day it was determined that testing could only be reliably carried out with repeatable results in an anechoic chamber using a GNSS Simulator. Two sets of tests have been developed to cover typical Land and Maritime operational scenarios. As well as the "typical" condition, various parameters of the GNSS simulator are then varied to provide a range of scenarios around the "typical" condition. Some of these scenarios are less arduous and other more so to provide a range of tests that together provide an assessment of the capability of the GNSS Receiver in the PLB under test. In addition other test scenarios are also included to check for issues such as GPS Week Rollover, change of beacon location around the world and change of GPS Date as may be seen by a beacon that is not activated for several years.

Each applicable scenario is run one after the other (the beacon being turned off in between scenarios to force it to “Cold Start” each time) and the Time To First Fix (TTFF) and transmitted Location are recorded in each case. The results are then analyzed and an assessment of the performance of the GNSS Receiver in the PLB under test is made.

G.2.2 Land Scenarios

The Land scenarios are based around a small clearing in the forest with a solid tree line surrounding it, variations in the scenarios then provide for increasing clearing size (easier reception) and increasing foliage cover (more difficult reception). The key parameters that are varied in the simulations are:

- The number of satellites in view
- The HDOP received based upon the number and position of the satellites
- The Received Signal Strength (RSS) as seen at the input to the PLB (i.e. on the earth’s surface)

G.2.3 Maritime Scenario

The Maritime scenarios are based around a beacon floating in the open sea with a clear view of the sky from 0 degrees above the horizon with Wind Force 5 and Sea State 4, which represents typical sea conditions. Movement rates for the beacon in the water due to large waves and for wave wash over effects are then introduced to provide a range of operational conditions. The key parameters that are varied in these simulations are:

- The Rate of Change (i.e. the speed the beacon bobs at)
- The Degree of Change (i.e. the amount the beacon tilts)
- “Wash over” effects causing corruption of the Ephemeris data download and reduction in Received Signal Strength

The motion that has been created to simulate the movement of the 406 Beacon in the sea is a repeating sequence of; axial pitch up - roll right - pitch down - roll left. Note – In some simulators, the maritime conditions may be best simulated using an aviation type scenario where roll and pitch excursions and rate can be exactly specified.

G.2.4 Scenarios

The following tables provide a list of the Land and Maritime scenarios for testing the PLB. Each scenario runs for approximately 12 minutes and there are 30 Land scenarios and 26 maritime scenarios making 56 scenarios in total. In the worst case if it takes 12 minutes to complete each scenario and then 3 minutes to set up for the next one. It would take 14 hours (2 days) to complete all the tests. However an average TTFF of around 5 minutes is expected and thus it should typically be possible to complete all the tests in 7½ hours (one day).

Further details on these scenarios including the data necessary to develop scenarios for different makes of GNSS simulator can be found in Annex G.7.

Table G.1 – Land Scenarios

Scenario #	No of SVs	HDOP	RSS dBm	GPS Location	GPS Year
1	3	4	-123	USA	2008
2	3	4	-130	USA	2008
3	3	4	-137	USA	2008
4	3	10	-123	USA	2008
5	3	10	-130	USA	2008
7	3	20	-123	USA	2008
8	3	20	-130	USA	2008
13	4	4	-123	USA	2008
14	4	4	-130	USA	2008
15	4	4	-137	USA	2008
16	4	10	-123	USA	2008
17	4	10	-130	USA	2008
19	4	20	-123	USA	2008
20	4	20	-130	USA	2008
25	5	4	-123	USA	2008
26	5	4	-130	USA	2008
27	5	4	-137	USA	2008
28	5	10	-123	USA	2008
29	5	10	-130	USA	2008
31	5	20	-123	USA	2008
32	5	20	-130	USA	2008
34	6	4	-123	USA	2008
35	6	4	-130	USA	2008
36	6	4	-137	USA	2008
37	4	4	-130	USA	2019
38	4	4	-130	Australia	2019
39	4	4	-130	Russia	2019
40	4	4	-130	Russia	2025
41	4	4	-130	Russia	2040
42	4	4	-130	USA	2025

Table G.2 – Maritime Scenarios

Scenario #	No of SVs	HDOP	RSS dBm	Pitch/ Roll (Deg)	Rate (Deg/s)	Data Corrupt	GPS Location	GPS Year
1	7	2	-130	15	5	No	0N, 0E	2008
2	7	2	-130	15	15	No	0N, 0E	2008
6	7	2	-130	30	60	No	0N, 0E	2008
7	7	2	-130	60	5	No	0N, 0E	2008
8	7	2	-130	60	15	No	0N, 0E	2008
9	7	2	-130	60	60	No	0N, 0E	2008
12	6	2	-130	15	60	No	80N, 0E	2008
13	6	2	-130	30	5	No	80N, 0E	2008
14	6	2	-130	30	15	No	80N, 0E	2008
16	6	2	-130	60	5	No	80N, 0E	2008
17	6	2	-130	60	15	No	80N, 0E	2008
18	6	2	-130	60	60	No	80N, 0E	2008
20	7	2	-130	15	5	Ephemer1	0N, 0E	2008
22	7	2	-130	15	5	Ephemer2	0N, 0E	2008
24	7	2	-130	15	5	Almanac	0N, 0E	2008
26	7	2	-130	15	5	Time	0N, 0E	2008
28	7	2	-130	15	5	E1 + A	0N, 0E	2008
30	7	2	-130	15	5	E1 + T	0N, 0E	2008
32	7	2	-130	15	5	A + T	0N, 0E	2008
33	7	2	-135	0	0	No	0N, 0E	2008
34	7	2	-135	15	5	No	0N, 0E	2008
35	7	2	-135	0	0	Ephemer1	0N, 0E	2008
36	7	2	-135	15	5	Ephemer1	0N, 0E	2008
37	7	2	-130	0	0	No	44S, 175E	2008
38	7	2	-130	0	0	No	47N, 8E	2019
39	7	2	-130	0	0	No	0N, 0E	2019

Table Key

Data Corruption – E1 = Ephemeris 1, E2 = Ephemeris 2, A = Almanac, T = Time

The above Scenarios are available free of charge as files to download and run on most Spirent GNSS Simulators. In order to obtain copies of the files please email Spirent at help@spirentcom.com quoting "RTCM Scenarios". For other makes of Simulator refer to Annex G.7.

G.3 TEST FACILITY REQUIREMENTS, TEST SET UP AND CALIBRATION

G.3.1 Test Facility Requirements

The tests shall be performed in an independent test facility that meets the following requirements:

a) First, that the selected facility shall provide shielding of external RF signals at the L1 GPS frequency. At least 35 dB of shielding must be provided. This is to keep signals from any operational GPS at least 20 dB below the -137 dBm signal level specified in some test scenarios. This will ensure that GPS signals from orbiting GPS Satellites are not received by the beacon's GPS receiver and corrupt the test results.

b) Second, the facility should have radiation absorbing material on the walls ceilings and floor to prevent signal reflections from distorting the direct path L1 GPS signal from the re-radiating antenna. Sufficient attenuation shall be provided to ensure that reflected signals off any surfaces are at least 20 dB below the direct path signal level measured at the beacon's GPS receiver's antenna location.

c) Third, that there is a way to calibrate the facility to obtain the desired level of the L1 GPS frequency EIRP as seen by the GPS receiver antenna at the beacon's GPS antenna mounted in the proper position for the test and that that signal level is stable over time.

d) Fourth, the facility must provide at least 80 dB of attenuation at 406 MHz to prevent beacon transmissions not using a test protocol from impacting the operational Cospas-Sarsat system.

e) Fifth, the facility must provide at least 50 dB of attenuation at 121.5 MHz to ensure that the beacon's 121.5 MHz homer signal cannot be picked up as a 121.5 MHz distress signal by an over flying aircraft. Since the Beacon's homer, if it has one, must be activated for these nav tests, it is not permissible to simply turn off the homer.

Examples of such facilities are an Anechoic Chamber, a TEM cell (also known as a Crawford Cell), and an EMI or RFI Quiet Room (a screen room with radiation absorbing material on the floor/ceiling and walls). Other types of test facilities could be used such as a screen room, but it must be shown that the above requirements are satisfied.

G.3.2 Test Set Up

A typical Test Set Up is shown in figure G.1 below. Depending on the output power of the GPS simulator used, an external Amplifier and/or Attenuator may be required. A suitable antenna transmitting at the GPS L1 frequency shall be used to radiate the GPS Simulator signals in the chamber. This procedure calls it a re-radiating antenna. Alternative set ups may be used if the test provider can show that they are equivalent to the set up shown.

The Re-radiating antenna and the PLB under test shall be placed in direct line with one another such that the normal to the PLB's GPS patch antenna is collinear with the bore sight of the re-radiating antenna at a spacing that puts the beacon under test in the far field of both antennas. If an anechoic chamber or EMI Quiet room is used, the actual distance between the antennas isn't critical as long as the beacon under test is in the far field of both antennas.

A Beacon Tester capable of decoding the 406 MHz location protocol bursts transmitted by the PLB shall be sited near the PLB but must not interfere with the direct path between the re-radiating antenna and the PLB's GPS antenna.

The manufacturer shall provide evidence of the time it takes all of the power supplies within the PLB to drop to 0V (in this case 0V means less than 0.1Vdc). The minimum time between tests that the PLB shall remain off for is the above time plus one minute. This is to ensure that no GNSS data from previous tests is stored in the Receiver and that it cold starts for each test scenario.

Prior to commencing testing, the Test Set Up shall be calibrated (see G.3.3 below) to ensure that the signal levels at the surface of the PLB are correct.

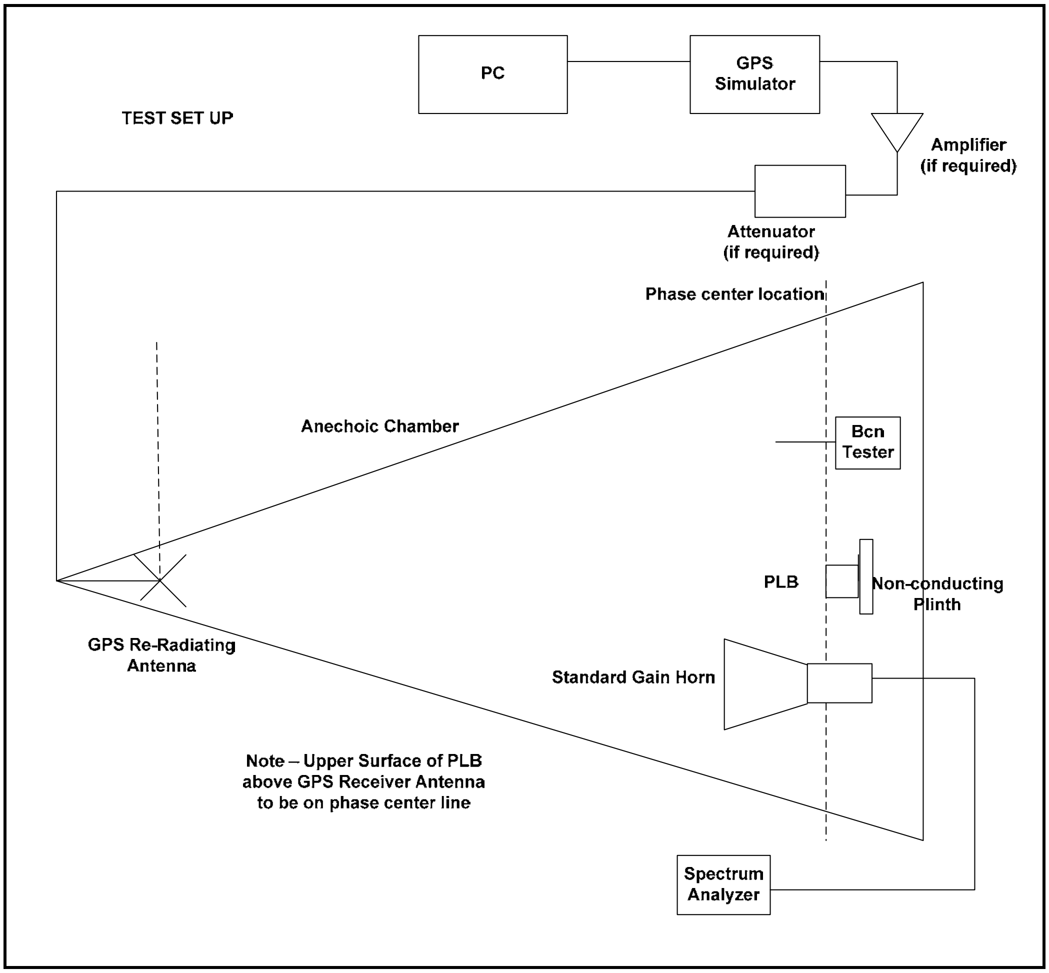

Figure G.1 – Test Set Up

G.3.3 Calibration of the Test Set Up

The Test Set Up shall be calibrated on a Received Signal Level basis as detailed below.

The following figure G.2 illustrates a calibration setup. A power meter is shown although a calibrated spectrum analyzer could be used as well. A Standard gain horn is shown although any reference antenna (where the gain, phase center location and polarization is known) could be used. The equations below refer to a RefAnt (reference antenna). The top figure illustrates calibration of the external amplifiers/ and or attenuators. Note that some GPS simulators have a high power port that may be used for the test and the port's gain relative to the true output power port may be dependent on the number of satellites in the scenario. If this is the case, one should have the capability of adjusting the signal level by means of an external attenuator and/or amplifier.

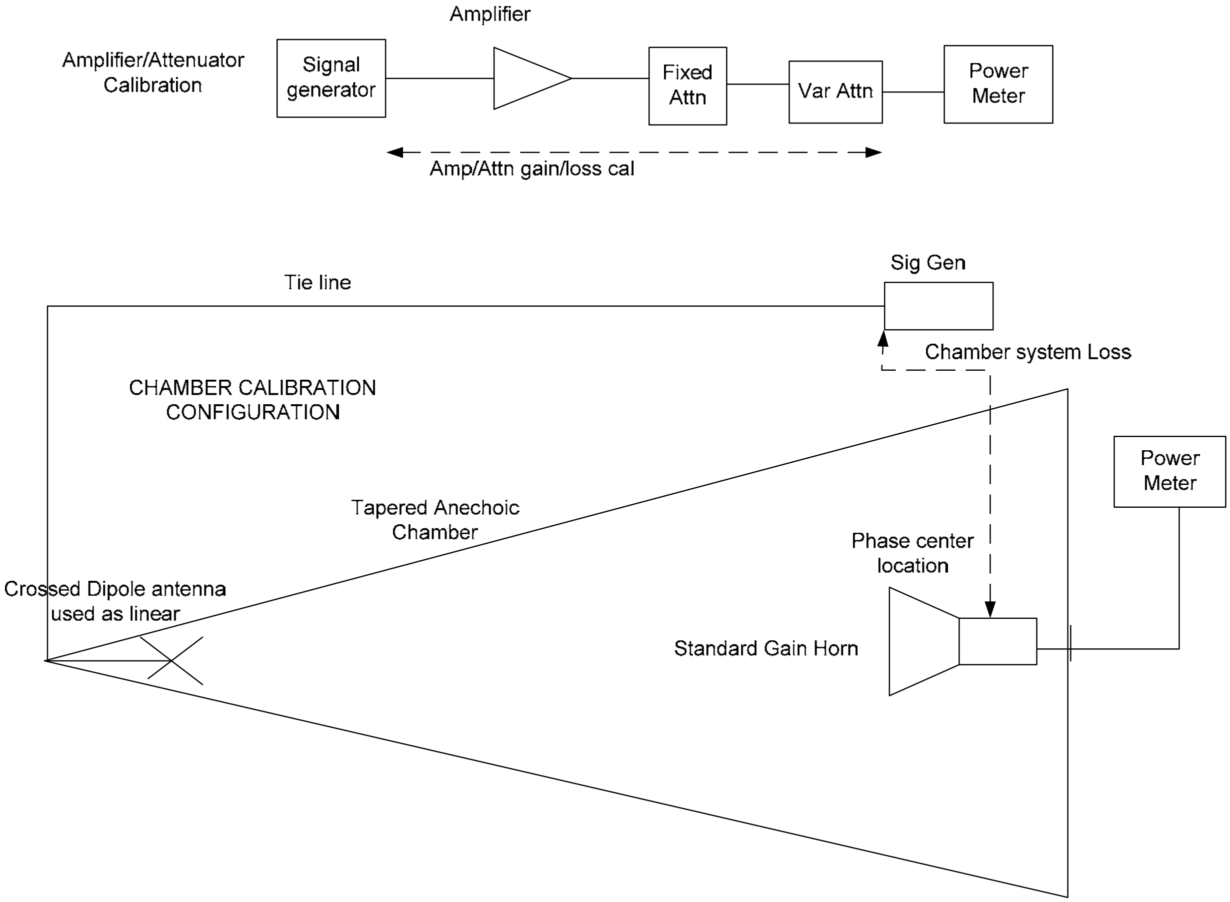

Figure G.2 – Calibration Set Up

The PLB shall be substituted with a Standard Gain Horn or equivalent antenna (of known gain at the GPS L1 frequency and known phase center location) connected to a spectrum analyser or power meter, and positioned such that the focal point (phase center) of the horn or equivalent antenna is on the phase center line .of the PLB's GPS antenna when mounted.

A calibrated signal generator shall be used as the signal source to calibrate the system. For the purposes of calibration, the signal generator shall replace the GPS simulator in the above diagram. A strong CW signal is needed in order for the spectrum analyzer (or power meter) to see the signal. The "chamber system loss" is the loss one is trying to find and it is defined as the loss measured from the output of the calibrated signal generator to the phase center of the standard gain horn or equivalent antenna. This loss will be exactly the same as the loss from the output port of the GPS simulator in the test configuration to the phase center of the PLB's GPS antenna. All losses or gains of all elements including any polarization mismatch losses in both the calibration configuration and the actual test configuration shall be accounted for in a link calculation.

The link equation for determining the Chamber Gain/Loss ($Gain_{Chamber}$) in dB is defined as follows:

$$P_{transmit} + Gain_{Chamber} + Gain_{RefAnt} + Gain_{line} + Gain_{Pol} = P_{received}$$

Where $P_{transmit}$ is the Signal Generator transmit power level

$Gain_{Chamber}$ is the gain from the output of the Signal Generator to the EIRP incident on the reference antenna (will be a negative number if it is a loss). In the diagram in this calibration section, this term is shown as a chamber system loss.

$Gain_{RefAnt}$ is the gain of a reference antenna such as a standard gain horn (a positive number if there is a gain)

$Gain_{line}$ is the Reference antenna to receiver (power meter or spectrum analyzer) cable gain (a negative number if a loss – a positive number if there is an LNA in the system)

$Gain_{Pol}$ is a polarization gain (non zero if there is a polarization mismatch between the Ref Ant and the PLB's GPS antenna). The polarization of the transmit antenna (re-radiating antenna is taken care of in the Chamber Gain number.

And $P_{received}$ is the received power level in a power meter or spectrum analyzer

It should be noted that depending on the reference used for $P_{transmit}$ and $P_{received}$ either or both of these terms could be negative, thus it is important to include the signs of these terms in the following equations

The following table G.3 illustrates the $Gain_{Pol}$ values

Table G.3 – $Gain_{Pol}$ Values

Ref Antenna Polarization	PLB's GPS Antenna polarization	$Gain_{Pol}$
CP	CP	0
Linear	CP	-3
CP	Linear	+3

Rewriting the above equation and solving for the Chamber Gain

$Gain_{Chamber} = P_{received} – P_{transmit} – (Gain_{RefAnt} + Gain_{line} + Gain_{Pol})$

The required EIRP level into the PLB under test is defined as follows:

$EIRP_{plb} = P_{Scenario} + Gain_{Simulator\ high\ power\ port} + Gain_{Chamber} + Gain_{Amp/Attn}$

Where:

$P_{Scenario}$ is the scenario's power level coming out the GPS simulators normal power port

$Gain_{Simulator\ high\ power\ port}$ is the gain of the high power port relative to the normal simulators power output port (scenario will usually require use of a high power port – otherwise the losses in the chamber will have to be made up by amplification.

$Gain_{Chamber}$ is the number calculated above and

$Gain_{Amp/Attn}$ is any other gain/loss required by the link. It may be an external amplifier or attenuator or both.

$EIRP_{plb}$ is the EIRP incident upon the PLB's GPS antenna. This number will be equivalent to the power number specified in the scenario.

For some GPS simulators there may be a difference between the GPS simulator's normal output port and a higher power monitor port which is dependent on the number of SV's (GPS satellites) in the scenario. This number will be available from the vendor of the GPS simulator. If this is the case, then different amplifier/attenuator settings are required and a calculation of the amplifier/attenuator setting should be done for the system when there is 3, 4, 5, 6 and 7 SV's present.

Once the desired EIRP levels into the PLB are calculated, the set up is now calibrated and the reference antenna can be removed and replaced with the PLB under test and the Signal Generator can be replaced with the GPS Simulator.

It should be noted that once the system has been calibrated no further adjustments to the Simulator output power levels shall be made during any of the simulator tests. If for some reason the level is adjusted or the set up is changed or there is reason to query the results obtained then the set up shall be re-calibrated as described herein before carrying out any further tests.

G.4 METHOD OF MEASUREMENT

With the equipment set up as described in G.3.1 above and after the set up has been calibrated Land Test Scenario 1 should be loaded into the Simulator. The Scenario should then be started and within 10 seconds of the scenario starting the PLB shall be switched on. At the same time as the PLB is activated a stopwatch or similar timer shall be started.

The Scenario is then left to run until either a GPS fix is obtained and a location protocol message containing position is received by the Beacon Tester or the Scenario runs to completion plus one minute (to allow for just missing a 50 second burst) and no message containing position has been received by the Beacon Tester (i.e. only default locations have been received).

If a location is received on the Beacon Tester then the stop watch or timer shall immediately be stopped and the time and received location shall be recorded in the Test Results Tables (see G.6). Note that the first transmitted location as received by the Beacon Tester is the one that should be recorded, any subsequent updated locations should be ignored. If a location is not received within 13 minutes of starting the Scenario then a "Fail" shall be indicated for that Scenario in the Table, in which case the Scenario is NOT repeated and the next Scenario is loaded as described below.

It may be possible to observe a visual indication on the PLB that a GPS fix has been obtained, in which case this can be used as an indicator that the next burst from the PLB should contain location. Note that the TTFF is the time until the PLB transmits a burst containing location data, not the time until an indicator on the PLB indicates that a GPS fix has been obtained.

The PLB is then switched off and left turned off for at least the specified time interval (see G.3.2). During this period the next Scenario is loaded into the Simulator and the Beacon Tester and stop watch are reset. Once the specified PLB off period has elapsed this procedure should be repeated.

Once all the Land Scenarios have been completed, the Maritime Scenarios shall be run following the same procedure. Once all the results have been obtained they should be analyzed as specified in G.5 below to determine if the PLB has passed the tests.

G.5 REQUIRED RESULTS

The TTFF for each Scenario along with the Transmitted Location shall be recorded in the Test Results Tables in G.6. If no location is obtained for a particular scenario then a "Fail" shall be recorded in both the TTFF and the PLB Location columns.

Once all the Scenarios have been run the delta location error (i.e. the difference between the simulator position and the PLB reported position) for each Scenario shall be calculated and recorded in the Test Results Tables using the following formula:

Location Error (m) = $(((\text{SL Lat} - \text{TL Lat})*111000)^2 + ((\text{SL Long} - \text{TL Long})*111320*\cos(\text{SL Lat}))^2)^{1/2}$

where:

SL Lat = The Simulator Location Latitude in decimal Degrees (e.g. 39.60000° N instead of 39° 36' N) to 5 decimal places.

TL Lat = The PLB Transmitted Location Latitude in decimal Degrees to 5 decimal places.

SL Long = The Simulator Location Longitude in decimal Degrees to 5 decimal places.

TL Long = The PLB Transmitted Location Longitude in decimal Degrees to 5 decimal places.

The number of successful Land and Maritime TTFF tests (those in which a location was obtained within 13 minutes) shall each be added up and the percentage pass rate for each set of Scenarios shall be calculated. The PLB shall be deemed to have passed the TTFF Test if the pass rate for both Land and Maritime Scenarios is ≥70%.

The number of successful Land and Maritime Location Accuracy tests (those with a location error of less than 650m) shall each be added up and the percentage pass rate for each set of Scenarios shall be calculated. The PLB shall be deemed to have passed the Location Accuracy Test if the pass rate for both Land and Maritime Scenarios is ≥70%.

The PLB shall be required to pass both parts of the test (TTFF and Location Accuracy) in order to demonstrate compliance with this test procedure. All results shall be recorded in the Results Analysis Table in G.6.

G.6 TEST RESULTS

G.6.1 Test Results Sheets

The results of the testing shall be documented on the following test results sheets and the necessary calculations (using the formula in G.5) should then be carried out to determine the location error for each scenario.

Table G.4 – Land Scenarios Test Results

Scenario #	TTFF (min : sec)	Simulator Location	PLB Transmitted Location	Location Error (m)
1		39° 36’ N, 119° 35’ W		
2		39° 36’ N, 119° 35’ W		
3		39° 36’ N, 119° 35’ W		
4		39° 36’ N, 119° 35’ W		
5		39° 36’ N, 119° 35’ W		
7		39° 36’ N, 119° 35’ W		
8		39° 36’ N, 119° 35’ W		
13		39° 36’ N, 119° 35’ W		
14		39° 36’ N, 119° 35’ W		
15		39° 36’ N, 119° 35’ W		
16		39° 36’ N, 119° 35’ W		
17		39° 36’ N, 119° 35’ W		
19		39° 36’ N, 119° 35’ W		
20		39° 36’ N, 119° 35’ W		
25		39° 36’ N, 119° 35’ W		
26		39° 36’ N, 119° 35’ W		
27		39° 36’ N, 119° 35’ W		
28		39° 36’ N, 119° 35’ W		
29		39° 36’ N, 119° 35’ W		
31		39° 36’ N, 119° 35’ W		
32		39° 36’ N, 119° 35’ W		
34		39° 36’ N, 119° 35’ W		
35		39° 36’ N, 119° 35’ W		
36		39° 36’ N, 119° 35’ W		
37		39° 36’ N, 119° 35’ W		
38		23° 42.01668’ S 133° 53.83336’ E		
39		71° 37.56666’ N 128° 52.06668’ E		
40		71° 37.56666’ N 128° 52.06668’ E		
41		71° 37.56666’ N 128° 52.06668’ E		
42		39° 36’ N, 119° 35’ W		

Table G.5 – Maritime Scenarios Test Results

Scenario #	TTFF (min : sec)	Simulator Location	PLB Transmitted Location	Location Error (m)
1		0° 0’ N, 0° 0’ E		
2		0° 0’ N, 0° 0’ E		
6		0° 0’ N, 0° 0’ E		
7		0° 0’ N, 0° 0’ E		
8		0° 0’ N, 0° 0’ E		
9		0° 0’ N, 0° 0’ E		
12		80° 0’ N, 0° 0’ E		
13		80° 0’ N, 0° 0’ E		
14		80° 0’ N, 0° 0’ E		
16		80° 0’ N, 0° 0’ E		
17		80° 0’ N, 0° 0’ E		
18		80° 0’ N, 0° 0’ E		
20		0° 0’ N, 0° 0’ E		
22		0° 0’ N, 0° 0’ E		
24		0° 0’ N, 0° 0’ E		
26		0° 0’ N, 0° 0’ E		
28		0° 0’ N, 0° 0’ E		
30		0° 0’ N, 0° 0’ E		
32		0° 0’ N, 0° 0’ E		
33		0° 0’ N, 0° 0’ E		
34		0° 0’ N, 0° 0’ E		
35		0° 0’ N, 0° 0’ E		
36		0° 0’ N, 0° 0’ E		
37		44° 0’ S, 175° 0’ E		
38		47° 0’ N, 8° 0’ E		
39		0° 0’ N, 0° 0’ E		

G.6.2 Results Analysis Tables

Table G.6 – Land Scenarios Results Analysis

Calculate the following data and enter it in the results columns of the Tables below.

Criteria	Limit / Condition	Result
No of Successful Tests	TTFF ≤ 13 minutes	
Total No of Land Scenarios	30	N/A
TTFF Percentage Success Rate	(No Success Tests / 30) * 100	
TTFF Pass / Fail Limit	≥ 70%	N/A
No of Locations with Errors	≤ 650m	
No of Scenarios with Locations	Enter result	
Location Accuracy Percentage Pass Rate	(No Locations Errors ≤ 650m / No Scenarios with Location) * 100	
Location Accuracy Pass / Fail Limit	≥ 70%	N/A

Table G.7 – Maritime Scenarios Results Analysis

Criteria	Limit / Condition	Result
No of Successful Tests	TTFF ≤ 13 minutes	
Total No of Land Scenarios	26	N/A
TTFF Percentage Success Rate	(No Success Tests / 26) * 100	
TTFF Pass / Fail Limit	≥ 70%	N/A
No of Locations with Errors	≤ 650m	
No of Scenarios with Locations	Enter result	
Location Accuracy Percentage Pass Rate	(No Locations Errors ≤ 650m / No Scenarios with Location) * 100	
Location Accuracy Pass / Fail Limit	≥ 70%	N/A

Table G.8 – Pass/Fail Analysis

	PLB Pass / Fail
Land TTFF Success Rate ≥ 70%	
Land Location Accuracy Pass Rate ≥ 70%	
Maritime TTFF Success Rate ≥ 70%	
Maritime Location Accuracy Pass Rate ≥ 70%	
All four results must be a “Pass” for the PLB to pass, any one or more “Fails” indicates failure	

G.7 Scenario definitions

There are 30 Land Scenarios and 26 Maritime Scenarios. Copies of these Scenarios are available free of charge as files to download and run on most Spirent GNSS Simulators. In order to obtain copies of the files please email Spirent at help@spirentcom.com quoting "RTCM Scenarios". For other makes of GNSS Simulator the data provided below shall be used to generate equivalent scenarios. The scenario provider shall provide evidence of the equivalence of the scenarios to the test laboratory performing the tests prior to any testing.

Scenario Length: The time duration of each scenario is 12 minutes zero seconds.

Reference date and time: The orbital reference date and time (UTC (SU)) defines the time and date at which orbit details are valid. This time is analogous to t_{oe} in the GPS satellite data message. For these scenarios, the reference time is defined to be 9/1/2002, at 00:00:00 UTC time.

Gravity model WGS-84: The scenarios listed below are referenced to gravity model WGS-84. The simulator shall be capable of selecting a reference of WGS-84 or a calculation shall be made to set up an equivalent reference.

G.7.1 Land Scenarios

G.7.1.1 Introduction

Most of the land scenarios simulate a GPS receiver in a forest clearing northeast of Reno Nevada USA measuring 100m in diameter. The trees surrounding the clearing are 15m tall, therefore the obscuration angle from the antenna is approximately 18 ^{o} (Signals from satellites below this elevation are considered to be completely obscured). No elevation masking shall be done. Alternatively, elevation masking shall be set to 0 degrees. Satellite selection determines the number of satellites visible in the scenario. All satellites will be turned off for the start of the scenario. Only those satellites selected for the scenario will be powered on at the start of the scenario. This allows the test operator to quickly check the scenario's status. The GPS receiver as the Unit under Test (UUT) shall be stationary. GDOP is specified by the satellites selected. Note that some simulators do not give a running list of the best GDOP available from the satellites selected but rather than from all that are in view, regardless of whether they are turned on or off.

Some scenarios have the UUT located in the southern hemisphere (Alice Springs, Australia) or the high latitude northern hemisphere (Tiksli, Russia). The UUT for these scenarios is also stationary.

G.7.1.2 Parameters

The following parameters apply to Land scenarios.

Test #: This number is the file number used by Spirent. If a non-Spirent simulator is used, this number shall be used to reference the test to the Spirent test.

Spirent Scenario Name: This name is the name of the file used by Spirent. It is descriptive of most but not all of the parameters used in the scenario.

#SV's: Number of GPS satellites used in the scenario. Others may be turned off.

GPS SV's: List of each satellite by PRN number selected for use by the scenario.

Target DOP: This parameter is the Target Dilution of Precision that the scenario tries to set up. This number will change due to satellite motion throughout the scenario.

Target Power level: The scenario Target power level is the out put of the simulator in dBm at the simulators RF output spigot. A calibration will need to be performed to ensure this level is seen by the UUT.

Scenario start date: The date the scenario uses in the format mm/dd/yyyy.

Scenario start time: The time is in the form hh:mm:ss in 24 hour clock format UTC.

N/S?: Defines which hemisphere the user is located at the start of the scenario - Northern (N) or Southern (S).

Initial Latitude: Latitude of the UUT at the start of the scenario in the format dd:mm:ss. For stationary users, this is the location used throughout the duration of the scenario.

E/W? Defines which hemisphere the UUT is located at the start of the scenario – Eastern (E) or Western (W).

Initial Longitude: Longitude of the UUT at the start of the scenario in the format ddd:mm:ss.

Height above mean sea level: Elevation of the UUT relative to mean sea level (in meters).

WGS-84 Geiod Height: The height above mean sea level translated to WGS-84 coordinate reference frame (in meters).

GPS WN Rollover: The GPS week number rolls over to 0 at 1024 weeks. This first (if 1 is specified) occurred on August 22nd, 1999, 1024 weeks after the GPS start date of 6th January 1980.

GPS wk No: The GPS Week Number Defines the week from the most recent rollover for the scenario's start time.

GDOP selection

GDOP is specified by the satellites selected. Note that some simulators do not give a running list of the best GDOP available from the satellites selected but rather than from all that are in view, regardless of whether they are turned on or off.

G.7.2 Maritime Scenarios

G.7.2.1 Introduction

A maritime environment at 0 deg latitude and 0 degrees longitude is selected for most scenarios. Some scenarios are 80 deg N 0 deg E and some others are located in New Zealand and Biscayne Beach Miami FL USA. Various roll/pitch range and rate situations are simulated. The UUT is essentially stationary, but a small velocity is selected to enable pitch and roll control. Some scenarios simulate antenna wash-over by corrupting certain words in the GPS digital downlink message. No elevation masking shall be done. Satellite selection will determine the number of satellites visible in the scenario. All satellites will be turned off for the start of the scenario. Only those satellites selected for the scenario will be powered on at the start of the scenario.

G.7.2.2 Pitch/Roll Sequence in Maritime Scenarios

The motion in this paragraph is described with respect to an observer on deck facing forward- in the direction of travel.

For those scenarios where there is pitch and roll, the scenario shall start at scenario time =0 with a pitch up to the + pitch limit at the specified pitch rate and pitch rate duration, then pitch down to 0 deg at the specified rate and duration, then roll cw to the roll limit at the specified roll rate and roll duration, than roll ccw back to 0 deg at the specified roll rate and duration, then pitch down to – pitch limit at the specified pitch rate and pitch rate duration, then pitch up to 0 deg at the specified pitch rate and duration, then roll ccw to the roll limit at the specified roll rate and roll rate duration, then roll cw back to 0 at the specified roll rate and duration and then repeat this sequence continuously for the remainder of the scenario.

Note that all scenarios do not have pitch and roll: some are motionless. Note that some simulators may require a selection of a certain type of vessel to activate the pitch/roll feature. For example, Spirent 7700 simulators require the use of an aircraft as the maritime vessel.

G.7.2.3 Parameters

The following parameters apply to Maritime scenarios.

Test #: This number is the file number used by Spirent. If a non-Spirent simulator is used, this number shall be used to reference the test to the Spirent test.

Spirent Scenario Name: This name is the name of the file used by Spirent. It is descriptive of most but not all of the parameters used in the scenario.

#SV's: Number of active GPS satellites in the scenario

GPS SV's: List of each active satellite by PRN number selected for use by the scenario. Satellites should be turned off prior to start of the scenario. This allows the test operator to quickly check the scenario's status.

Roll Range: This parameter specifies the limits of the roll used in the scenario. The form of the specification is ±dd. This in interpreted to mean the roll will vary from +dd degrees to –dd degrees.

Roll Rate of change: This parameter is specified in the form dd for ss.s. The roll rate is specified as degrees per second (dd) for duration in seconds (ss.s). i.e. 5 for 34 seconds equates to 5 deg/sec for 34 seconds.

Pitch Range: This parameter is the limit of the pitch used in the scenario. It takes the form ±dd. The pitch in the scenario will vary from +dd degrees to –dd degrees.

Pitch Rate of change: This parameter is in the form dd for ss.s. The pitch rate is specified as degrees per second (dd) for duration in seconds (ss.s). i.e. 5 for 34 seconds equates to 5 deg/sec for 34 seconds.

Note that the rate times the duration does not equal the maximum excursion of the motion. This is because of a finite acceleration and jerk specification in the Spirent simulator. The following table G.9 specifies the maximum parameter settings for the acceleration and jerk parameters for pitch and roll for Spirent simulators as well as the simulation step size used by Spirent.

Table G.9 – Maximum Parameter Values

Parameter → / Motion ↓	Simulation Step size (ms)	Max rate (rad/s)	Max Acceleration (rad/s^2)	Max Jerk (rad/s^3)
Roll	100	7	70	700
Pitch	100	7	70	700

Description of Corruption: Some scenarios specify parts of the navigational message to be corrupted to simulate antenna wash over by waves. Corruption can occur in Ephemeris, Time or Almanac parts of the navigation message. Specified navigational errors shall be added after parity correction so that parity will also be corrupted.

Target Power level: Scenario output power level in dBm at the RF spigot.

Scenario start date: The date the scenario uses in the format mm/dd/yyyy.

Scenario start time: The time of the start of the scenario is in the form hh:mm:ss in 24 hour clock format UTC.

N/S?: Defines which hemisphere the user is located at the start of the scenario - Northern (N) or Southern (S).

Initial Latitude: This parameter is the Latitude of the user at the start of the scenario in the format dd:mm:ss. For stationary users, this is the location used throughout the duration of the scenario.

E/W?: Defines which hemisphere the user is located at the start of the scenario – Eastern (E) or Western (W).

Initial Longitude: This parameter is the Longitude of the user at the start of the scenario in the format ddd:mm:ss.

Height above mean sea level (in meters).

WGS-84 Geiod Height: the height above mean sea level translated to WGS-84 reference (in meters).

Heading: Heading of the vessel measured in degrees clockwise from true North.

Speed: Speed of the vessel measured in meters/second.

GPS WN Rollover: The GPS week number rolls over to 0 at 1024 weeks. This first (if 1 is specified) occurred on August 22nd, 1999, 1024 weeks after the GPS start date of 6th January 1980.

GPS wk No: GPS Week Number Defines the week from the most recent rollover.

G.7.3 Land Scenario Tables

Table G.10 – Land Scenarios

Test #	Spirent File Date	Spirent Scenario Name	# SV's	GPS SV's	Target GDOP	target power level (dBm)	Scenario Start date	Scenario Start time (hr:min:sec) 24 hr clock	Initial Latitude Deg:min:sec	N/S ?	Initial Longitude (deg:min:sec)	E/W?	Height above mean sea level (m)	WGS-84 Geiod Height (m)	GPS WN roll-over	GPS Wk No.
1	9/25/07	Land PLB 3 sats HDOP = 4 power =-123dBm.scn	3	6,10,14	4	-123	3/1/2008	9:28:00	39:36:00	N	119:35:00	W	500	521.073	1	444
2	9/25/07	Land PLB 3 sats HDOP = 4 power =-130dBm	3	6,10,14	4	-130	3/1/2008	9:28:00	39:36:00	N	119:35:00	W	500	521.073	1	444
3	9/25/07	Land PLB 3 sats HDOP = 4 power =-137dBm	3	6,10,14	4	-137	3/1/2008	9:28:00	39:36:00	N	119:35:00	W	500	521.073	1	444
4	9/25/07	Land PLB 3 sats HDOP =10 power =-123dBm	3	7,10,13	10	-123	3/1/2008	9:28:00	39:36:00	N	119:35:00	W	500	521.073	1	444
5	9/25/07	Land PLB 3 sats HDOP =10 power =-130dBm	3	7,10,13	10	-130	3/1/2008	9:28:00	39:36:00	N	119:35:00	W	500	521.073	1	444
7	9/25/07	Land PLB 3 sats HDOP =20 power =-123dBm	3	6,13,20	20	-123	3/1/2008	8:56:00	39:36:00	N	119:35:00	W	500	521.073	1	444
8	9/25/07	Land PLB 3 sats HDOP =20 power =-130dBm	3	6,13,20	20	-130	3/1/2008	8:56:00	39:36:00	N	119:35:00	W	500	521.073	1	444
10	9/25/07	Land PLB 3 sats HDOP =50 power =-123dBm	3	6,10,14	50	-123	3/1/2008	9:00:00	39:36:00	N	119:35:00	W	500	521.073	1	444
11	9/25/07	Land PLB 3 sats HDOP =50 power =-130dBm	3	6,10,14	50	-130	3/1/2008	9:00:00	39:36:00	N	119:35:00	W	500	521.073	1	444
13	9/25/07	Land PLB 4 sats HDOP = 4 power =-123dBm	4	7,10,13,14	4	-123	3/1/2008	9:00:00	39:36:00	N	119:35:00	W	500	521.073	1	444
14	9/25/07	Land PLB 4 sats HDOP = 4 power =-130dBm	4	7,10,13,14	4	-130	3/1/2008	9:00:00	39:36:00	N	119:35:00	W	500	521.073	1	444
15	9/25/07	Land PLB 4 sats HDOP = 4 power =-137dBm	4	7,10,13,14	4	-137	3/1/2008	9:00:00	39:36:00	N	119:35:00	W	500	521.073	1	444
16	9/25/07	Land PLB 4 sats HDOP =10 power =-123dBm	4	6,7,13,20	10	-123	3/1/2008	9:10:00	39:36:00	N	119:35:00	W	500	521.073	1	444
17	9/25/07	Land PLB 4 sats HDOP =10 power =-130dBm	4	6,7,13,20	10	-130	3/1/2008	9:10:00	39:36:00	N	119:35:00	W	500	521.073	1	444
19	9/25/07	Land PLB 4 sats HDOP =20 power =-123dBm	4	7,13,14,23	20	-123	3/1/2008	9:35:00	39:36:00	N	119:35:00	W	500	521.073	1	444
20	9/25/07	Land PLB 4 sats HDOP =20 power =-130dBm	4	7,13,14,23	20	-130	3/1/2008	9:35:00	39:36:00	N	119:35:00	W	500	521.073	1	444
22	9/25/07	Land PLB 4sats HDOP =50 power =-123dBm	4	10,13,14,17	50	-123	3/1/2008	7:50:00	39:36:00	N	119:35:00	W	500	521.073	1	444
23	9/25/07	Land PLB 4 sats HDOP =50 power =-130dBm	4	10,13,14,17	50	-130	3/1/2008	7:50:00	39:36:00	N	119:35:00	W	500	521.073	1	444

Test #	Spirent File Date	Spirent Scenario Name	# SV's	GPS SV's	Target GDOP	target power level (dBm)	Scenario Start date	Scenario Start time (hr:min:sec) 24 hr clock	Initial Latitude Deg:min:sec	N/S ?	Initial Longitude (deg:min:sec)	E/W?	Height above mean sea level (m)	WGS-84 Geiod Height (m)	GPS WN roll-over	GPS Wk No.
25	9/25/07	Land PLB 5 sats HDOP = 4 power =-123dBm	5	4,7,10,13,14	4	-123	3/1/2008	9:10:00	39:36:00	N	119:35:00	W	500	521.073	1	444
26	9/25/07	Land PLB 5 sats HDOP = 4 power =-130dBm	5	4,7,10,13,14	4	-130	3/1/2008	9:10:00	39:36:00	N	119:35:00	W	500	521.073	1	444
27	9/25/07	Land PLB 5 sats HDOP = 4 power =-137dBm	5	4,7,10,13,14	4	-137	3/1/2008	9:10:00	39:36:00	N	119:35:00	W	500	521.073	1	444
28	9/25/07	Land PLB 5 sats HDOP =10 power =-123dBm	5	16,18,19,20,22	10	-123	3/1/2008	14:33:00	39:36:00	N	119:35:00	W	500	521.073	1	444
29	9/25/07	Land PLB 5 sats HDOP =10 power =-130dBm	5	16,18,19,20,22	10	-130	3/1/2008	14:33:00	39:36:00	N	119:35:00	W	500	521.073	1	444
31	9/25/07	Land PLB 5 sats HDOP =20 power =-123dBm	5	16,18,19,20,22	20	-123	3/1/2008	14:40:00	39:36:00	N	119:35:00	W	500	521.073	1	444
32	9/25/07	Land PLB 5 sats HDOP =20 power =-130dBm	5	16,18,19,20,22	20	-130	3/1/2008	14:40:00	39:36:00	N	119:35:00	W	500	521.073	1	444
34	May 2009	Land PLB 6 sats HDOP = 4 power =-123dBm	6	6, 14,23, 9,13,24	4	-123	3/1/2008	10:02:00	39:36:00	N	119:35:00	W	500	521.073	1	444
35	9/25/07	Land PLB 6 sats HDOP = 4 power =-130dBm	6	6,14,23, 9,13,24	4	-130	3/1/2008	10:02:00	39:36:00	N	119:35:00	W	500	521.073	1	444
36	9/25/07	Land PLB 6 sats HDOP = 4 power =-137dBm	6	6,14,23, 9,13,24	4	-137	3/1/2008	10:02:00	39:36:00	N	119:35:00	W	500	521.073	1	444
37	May 2009	Land PLB 4 sats HDOP=4 6 Apr 2019 rollover	4	6,7,9,14	4	-130	4/6/2019	23:55:00	39:36:00	N	119:35:00	W	500	521.073	1	1023
38	9/25/07	Land PLB 4 sats HDOP=4 Date 2019 loc Alice Springs power =-130	4	1,2,14,23	4	-130	4/4/2019	10:00:00	23:42:01	S	133:52:50	E	580	560.356	1	1023
39	9/25/07	Land PLB 4 sats HDOP=4 Date 2019 loc Tiksli	4	10,15,4,8	4	-130	4/4/2019	10:05:00	71:37:34	N	128:52:04	E	168	173.637	1	1023
40	9/25/07	Land PLB 4 sats HDOP=4 Date 2025 location Alice Springs power =-130	4	16,19,21,4	4	-130	4/20/2025	10:05:00	23:42:01	S	133:52:50	E	580	560.356	2	313
41	May 2009	Land PLB 4 sats HDOP=4 Date 2040 location Tiksli power =-130	4	4,8,10,15	4	-130	4/6/2040	10:05:00	71:37:34	N	128:52:04	E	168	173.637	3	71
42	9/25/07	Land PLB 4 sats HDOP=4 Date 2025 power =-130	4	13,14,23,24	4	-130	4/6/2040	10:05:00	39:36:00	N	119:35:00	W	500	521.073	2	313

G.7.4 Maritime Scenario Tables

Table G.11 – Maritime Scenarios

Test #	Spirent File Date	Spirent Scenario name	# SV's	GPS SV's	Roll range (deg)	Roll Rate of Change (deg/sec for # sec)	Pitch range (deg)	Pitch rate of change (deg/sec for # sec)	Description of Corruption	Test # (Spirent File #)	target power level (dBm)	Scenario Start date	Scenario Start time (hr:min: sec) 24 hr clock	Initial Latitude Deg:min: sec	N/S?	Initial Longitude (deg:min: sec)	E/W?	Height above mean sea level (m)	WGS-84 Geiod Height (m)	Heading (deg cw from N)	Speed (m/sec)	GPS WN roll-over	GPS Week No.
1	May 2009	EPIRB 7 SVs 15 deg at 5 deg per sec power = -130.scn	7	3, 9, 18, 22, 4, 6, 19	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	none	1	-130	3/1/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	444
2	June 2009	EPIRB 7 SVs 15 deg at 15 deg per sec power = -130.scn	7	3, 9, 18, 22, 4, 6, 19	±15	15 for 1.2 sec	±15	5.35714 for 3 sec	none	2	-130	3/1/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	444
6	June 2009	EPIRB 7 SVs 30 deg at 60 deg per sec power = -130.scn	7	20, 24, 14, 6, 9, 13, 23	±30	60 for 0.4 sec	±30	60 for 0.4 sec	none	6	-130	3/1/2008	12:00:00	80:00:00	N	0:00:00	E	0.000	-33.000	135.00	0.001	1	444
7	May 2009	EPIRB 7 SVs 60 deg at 5 deg per sec power = -130.scn	7	6, 9, 16, 13, 21, 22, 4	±60	5 for 12.2 sec	±60	5 for 12.2 sec	none	7	-130	3/1/2008	21:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	180.00	0.001	1	444
8	May 2009	EPIRB 7 SVs 60 deg at 15 deg per sec power = -130.scn	7	6, 9, 16, 13, 21, 22, 4	±60	15 for 4.2 sec	±60	15 for 4.2 sec	none	8	-130	3/1/2008	21:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	180.00	0.001	1	444
9	Sept2009	EPIRB 7 SVs 60 deg at 60 deg per sec power = -130.scn	7	6, 9, 16, 13, 21, 22, 4	±60	60 for 1.2 sec	±60	60 for 1.2 sec	none	9	-130	3/1/2008	21:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	180.00	0.001	1	444
12	May 2009	EPIRB 80 deg lat 15 deg at 60 deg per sec power = -130.scn	7	3, 6, 13, 14, 16, 20, 24	±15	50 for 0.5 sec	±15	50 for 0.5 sec	none	12	-130	2/29/2008	23:30:00	80:00:00	N	0:00:00	E	0.000	-33.000	135.00	0.001	1	444
13	Sept 2009	EPIRB 80 deg lat 30 deg at 5 deg per sec power = -130.scn	7	14, 24, 1, 16, 20, 5, 2	±30	5 for 6.2 sec	±30	5 for 6.2 sec	none	13	-130	3/1/2008	12:00:00	80:00:00	N	0:00:00	E	0.000	-33.000	135.00	0.001	1	444
14	May 2009	EPIRB 80 deg lat 30 deg at 15 deg per sec power = -130.scn	7	5, 14, 24, 1, 16, 20, 2	±30	15 for 2.2 sec	±30	15 for 2.2 sec	none	14	-130	3/1/2008	12:00:00	80:00:00	N	0:00:00	E	0.000	-33.000	135.00	0.001	1	444
16	May 2009	EPIRB 80 deg lat 60 deg at 5 deg per sec power = -130.scn	7	3, 7, 9, 10, 13, 17, 24	±60	5 for 12.2 sec	±60	5 for 12.2 sec	none	16	-130	3/1/2008	21:00:00	80:00:00	N	0:00:00	E	0.000	-33.000	180.00	0.001	1	444
17	May 2009	EPIRB 80 deg lat 60 deg at 15 deg per sec power = -130.scn	7	3, 7, 13, 24 , 10, 14, 6	±60	15 for 4.2 sec	±60	15 for 4.2 sec	none	17	-130	3/1/2008	21:00:00	80:00:00	N	0:00:00	E	0.000	-33.000	180.00	0.001	1	444
18	May 2009	EPIRB 80 deg lat 60 deg at 60 deg per sec power = -130.scn	7	3, 7, 13, 10, 17, 14, 6	±60	60 for 1.2 sec	±60	60 for 1.2 sec	none	18	-130	3/1/2008	21:00:00	80:00:00	N	0:00:00	E	0.000	-33.000	180.00	0.001	1	444

Test #	Spi-rent File Date	Spirent Scenario name	# SV's	GPS SV's	Roll range (deg)	Roll Rate of Change (deg/sec for # sec)	Pitch range (deg)	Pitch rate of change (deg/sec for # sec)	Description of Corruption	Test # (Spirent File #)	target power level (dBm)	Scenario Start date	Scenario Start time (hr:min:sec) 24 hr clock	Initial Latitude Deg:min:sec	N/S?	Initial Longitude (deg:min:sec)	E/W?	Height above mean sea level (m)	WGS-84 Geiod Height (m)	Heading (deg cw from N)	Speed (m/sec)	GPS WN roll-over	GPS Week No.
20	May 2009	EPIRB 7 SVs 15 deg pitch roll at 5 deg per sec; ephmeris 1 power = -130.scn	7	9, 13, 19, 20, 16, 22, 6	±15	5.35714 for 3.2 sec	±15	5.35714 for 3 sec	***Ephemeris 1 only*** : starting at 6 seconds into the scenario, for a period of 30 seconds, words 4-9 in subframe #2 are all set to zeros, then no nav errors for 30 seconds. This sequence repeats with no breaks until the end of the scenario. Otherwise, no nav errors.	20	-130	2/3/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	444
22	May 2009	EPIRB 7 SVs 15 deg pitch roll at 5 deg per sec; ephmeris 2 power = -130.scn	7	9, 13, 19, 20, 16, 22, 6	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	***Ephemeris 2 only*** : starting at 6 seconds into the scenario, for a period of 30 seconds, words 4-9 in subframe #2 are set to all zeros, then for a period of 30 seconds, words 4-9 in subframe #3 are set to all zero's. This sequence repeats with no breaks until end of scenario. Otherwise, no nav errors.	22	-130	2/3/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	444
24	May 2009	EPIRB 7 SVs 15 deg pitch roll at 5 deg per sec almanac power -130.scn	7	9, 13, 19, 20, 16, 22, 6	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	***Almanac only*** : for the entire scenario, words 4-9 in subframe #5 are set to all zeroes	24	-130	2/3/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.000	1	444
26	May 2009	EPIRB 7 SVs 15 deg pitch roll at 5 deg per sec Time power -130.scn	7	9, 13, 19, 20, 16, 22, 6	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	***Time only*** : Starting at 6 sec into scenario, words 4-9 in subframe #1 are all set to zeroes for 30 seconds, the normal for 30 seconds. Sequence repeats without break for entire scenario	26	-130	2/3/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.000	1	444
28	May 2009	EPIRB 7 SVs 15 deg roll + pitch at 5 deg per sec ephmeris 1 + Almanac power -130.scn	7	9, 13, 19, 20, 16, 22, 6	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	***Both Ephemeris 1 and Almanac.*** **For Almanac**: for the entire scenario, words 4-9 in subframe #5 are set to all zero and **for ephemeris 1**: starting at 6 seconds into the scenario, for a period of 30 seconds, words 4-9 in subframe #2 are all set to zeros, then no nav errors for 30 seconds. This sequence repeats with no breaks until the end of the scenario. Otherwise, no nav errors	28	-130	2/3/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	444
30	May 2009	EPIRB 7SVs 15 deg roll at 5 deg per sec epheremis 1+time power -130.scn	7	9, 13, 19, 20, 16, 22, 6	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	***Both Time and Ephemeris 1*** : Starting at 6 sec into scenario, words 4-9 in subframes #1 (Time) and #2 (Ephemeris 1) are all set to zeroes for 30 seconds, then set to normal for 30 seconds. Sequence repeats without break for entire scenario	30	-130	2/3/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	444
32	May 2009	EPIRB 7SVs 15 roll and pitch at 5 deg sec almanac + time power -130.scn	7	9, 13, 19, 20, 16, 22, 6	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	***Almanac and Time*** : **Almanac**: for the entire scenario, words 4-9 in subframe #5 are set to all zeroes and **Time**: starting at 6 sec into scenario, words 4-9 in subframe #1 are all set to zeroes for 30 seconds, the normal for 30 seconds. Sequence repeats without break for entire scenario	32	-130	2/3/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	444
33	May 2009	EPIRB 7 SVs no corruption power -135.scn	7	3, 9, 18, 22, 4, 6, 19	0	0	0	0	none	33	-135	3/1/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.000	1	444

Test #	Spi-rent File Date	Spirent Scenario name	# SV's	GPS SV's	Roll range (deg)	Roll Rate of Change (deg/sec for # sec)	Pitch range (deg)	Pitch rate of change (deg/sec for # sec)	Description of Corruption	Test # (Spir-ent File #)	target power level (dBm)	Scenario Start date	Scenario Start time (hr:min:sec) 24 hr clock	Initial Latitude Deg:min:sec	N/S?	Initial Longitude (deg:min:sec)	E/W?	Height above mean sea level (m)	WGS-84 Geiod Height (m)	Heading (deg cw from N)	Speed (m/sec)	GPS WN roll-over	GPS Week No.
34	May 2009	EPIRB 7SVs 15 deg at 15 dec per sec no corruption power -135.scn	7	3, 9, 18, 22, 4, 6, 19	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	none	34	-135	3/1/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	444
35	May 2009	EPIRB 7SVs;ephemeris 1 ; power =-135.scn	7	3, 9, 18, 22, 4, 6, 19	0	0	0	0	***Ephemeris 1 only*** : starting at 6 seconds into the scenario, for a period of 30 seconds, words 4-9 in subframe #2 are all set to zeros, then set to normal for a period of 30 seconds. This sequence repeats with no breaks until end of scenario. Otherwise, no nav errors.	35	-135	3/1/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	90.00	0.000	1	444
36	May 2009	EPIRB 7SVs 15 deg pitch + roll at 15 deg sec ephemeris 1; power= -135.scn	7	3, 9, 18, 22, 4, 6, 19	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	***Ephemeris 1 only*** : starting at 6 seconds into the scenario, for a period of 30 seconds, words 4-9 in subframe #2 are all set to zeros, then set to normal for a period of 30 seconds. This sequence repeats with no breaks until end of scenario. Otherwise, no nav errors.	36	-135	3/1/2008	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	444
37	May 2009	EPIRB 7SVs 15 deg at 15 deg sec New Zealand; power= -130.scn	7	4, 10, 11, 1, 8, 15, 17	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	none	37	-130	3/1/2008	0:00:00	44:03:00	S	174:09:00	E	0.000	-8.752	135.00	0.001	1	444
38	May 2009	EPIRB 7SVs 15 deg at 15 deg se ;Biscay 2019 power -130.scn	7	4, 11, 14, 15, 17, 8, 10	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	none	38	-130	3/1/2019	0:00:00	47:21:00	N	8:27:00	E	0.000	-56.983	135.00	0.001	1	1018
39	May 2009	EPIRB 7SVs 15 deg at 15 deg sec 2019 no corruption;power= -135.scn	7	8, 15, 24, 14, 10, 23, 17	±15	5 for 3.2 sec	±15	5.35714 for 3 sec	none	39	-135	3/1/2019	0:00:00	0:00:00	N	0:00:00	E	0.000	-18.000	135.00	0.001	1	1018